What is claimed is:

1.   An image processing apparatus, to which an image including a line pattern such as a character, a ruled line, a graphic, etc. is input, outputting a corresponding binary image, comprising:

a slightly indistinct binary image generating unit generating a first image that includes almost an entire shape of a line pattern although the shape is indistinct;

a shape-preserved binary image generating unit generating a second image that includes almost the entire shape of the line pattern and also includes noise in a background area other than a neighborhood of the line pattern; and

an image combining unit combining the first and the second images for each pixel, and generating a satisfactory binary image that includes almost the entire shape of the line pattern while preserving the shape and does not include the noise in the background area.

2.   The image processing apparatus according to claim 1, further comprising

a background noise eliminating unit eliminating

the noise in the background area from the first and the second images.

3. The image processing apparatus according to claim 2, wherein

said background noise eliminating unit eliminates the background noise by classifying concatenated components into a concatenated component including a line pattern and a concatenated component being background noise based on distributions of the number of black pixels to an average edge intensity of 4- or 8-concatenated components of black pixels of a binary image being an input first or second image, and by removing a concatenated component determined to be the background noise.

4. The information processing apparatus according to claim 2, wherein

said background noise eliminating unit determines a certain pixel to be a background pixel if a standard deviation or an average density difference of densities of neighboring pixels of the certain pixel of an input first or second image is within a predetermined range.

5. The image processing apparatus according to

claim 1, wherein

the first and the second images are generated by performing the Niblack local binarization method for an input image.

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6.   The image processing apparatus according to claim 1, wherein

the Yanowitz and Bruckstein's postprocessing is performed for an output of said image combining unit.

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7.   An image processing method inputting an image including a line pattern such as a character, a ruled line, a graphic, etc., and outputting a corresponding binary image, comprising:

15   generating a first image that includes almost an entire shape of a line pattern although the shape is indistinct;

generating a second image that includes almost the entire shape of the line pattern and also includes noise

20   in a background area other than a neighborhood of the line pattern; and

combining the first and the second images for each pixel, and generating a satisfactory binary image that includes almost the entire shape of the line pattern

25   while preserving the shape, and does not include the

noise in the background area.

8.   A   program   for   causing   an   information
processing device to execute an image processing method
inputting an image including a line pattern such as a
character, a ruled line, a graphic, etc., and outputting
a corresponding binary image, the method comprising:

generating a first image that includes almost an
entire shape of a line pattern although the shape is
indistinct;

generating a second image that includes almost the
entire shape of the line pattern and also includes noise
in a background area other than a neighborhood of the
line pattern; and

combining the first and the second images for each
pixel, and generating a satisfactory binary image that
includes almost the entire shape of the line pattern
while preserving the shape, and does not include the
noise in the background area.

9.   A storage medium readable by an information
processing device, on which is recorded a program for
causing the information processing device to execute
an image processing method inputting an image including
a line pattern such as a character, a ruled line, a

graphic, etc., and outputting a corresponding binary image, the method comprising:

generating a first image that includes almost an entire shape of a line pattern although the shape is

5   indistinct;

generating a second image that includes almost the entire shape of the line pattern and also includes noise in a background area other than a neighborhood of the line pattern; and

10   combining the first and the second images for each pixel, and generating a satisfactory binary image that includes almost the entire shape of the line pattern while preserving the shape, and does not include the noise in the background area.

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